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IS 10611 (1983): Steel Gate Valves (Flanged and Butt-welded Ends) for Petroleum, Petrochemicals and Allied Industries [MED 17: Chemical Engineering Plants and Related Equipment]

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Indian Standard

SPECIFICATION FOR STEEL GATE VALVES (FLANGED AND BUTT-WELDED ENDS) FOR PETROLEUM, PETROCHEMICALS AND ALLIED INDUSTRIES

Industrial Valves Sectional Committee, EDC 81 [Ref : Doc : EDC 81 (3660)]

1. Scope — Specifies the requirements for steel gate valves with flanged or butt-welded ends.

1.1 [illegible] standard covers valves in nominal size of 25 mm to 600 mm corresponding to nominal sizes [illegible] in IS : 9520-1980 ' Nominal sizes for valves '.

1.2 The valve shall be outside screw and yoke type (OS and Y) with rising stem, non-rising handwheel, bolted bonnet and with various types of gates.

1.3 The standard nomenclature for valve parts is shown in Fig. 1, which is also illustrative of some acceptable gate valve designs.

2. Design

2.1 *Pressure/Temperature Rating* — The pressure/temperature ratings for the valve covered by this standard shall be as specified in ' Indian Standard specification for steel pipe flanges and flanged fitting (*under preparation*) ', for respective body materials. Each pressure rating is the maximum allowable sustained non-shock pressure at the corresponding tabulated temperature.

2.1.1 Pressure/temperature ratings may be interpolated between the pressure/temperature tabulated for intermediate service conditions.

2.1.2 The design metal temperature for determining the pressure rating shall be selected by the purchaser, subject to requirements of the applicable code.

2.2 *Valve Body and Bonnet* — The minimum wall thickness of the valve body and bonnet shall conform with the thickness as shown in Table 1.

Drilling of or pinning to the valve is not permissible where this would reduce the effective thickness below minimum permitted value (for fixing plates, etc).

2.2.1 Face to face and centre to centre dimensions for raised face flanged ends and end to end and centre to end dimensions for butt-welded ring joint flanged end valves shall conform to IS : 9884-1981 ' Dimensions for ferrous valves face-to-face and end-to-end.

2.2.2 End flanges shall be cast or forged integral with the body except that flanges may be attached by welding if so specified in the purchase order. End flanges attached by welding shall be butt-welding type and the welds including qualification of welding procedure and welding operator shall be as specified in IS : 2825-1969 ' Code for unfired pressure vessels ', or as specified *in the purchase order.*

2.2.3 End flange dimensions shall be as specified in ' Indian Standard specification for steel pipe flanges and flanged fittings (*under preparation*) ', for the facing specified in the purchase order. The end flanges shall be provided with 1·6 mm raised face for class 150 and class 300 and 6·4 mm raised face for higher ratings. The end flanges shall be machine finished on the joint side and spot faced or back faced for the type of facings specified in the purchase order.

2.2.4 Facing finish of raised faced end flanges shall be either serrated, concentric or serrated spiral having 24 to 50 grams per 25 mm. The resultant surface finish shall have approximately 3 2 [illegible] surface roughness number.

Adopted 15 March 1983 © January 1984, ISI Gr 7

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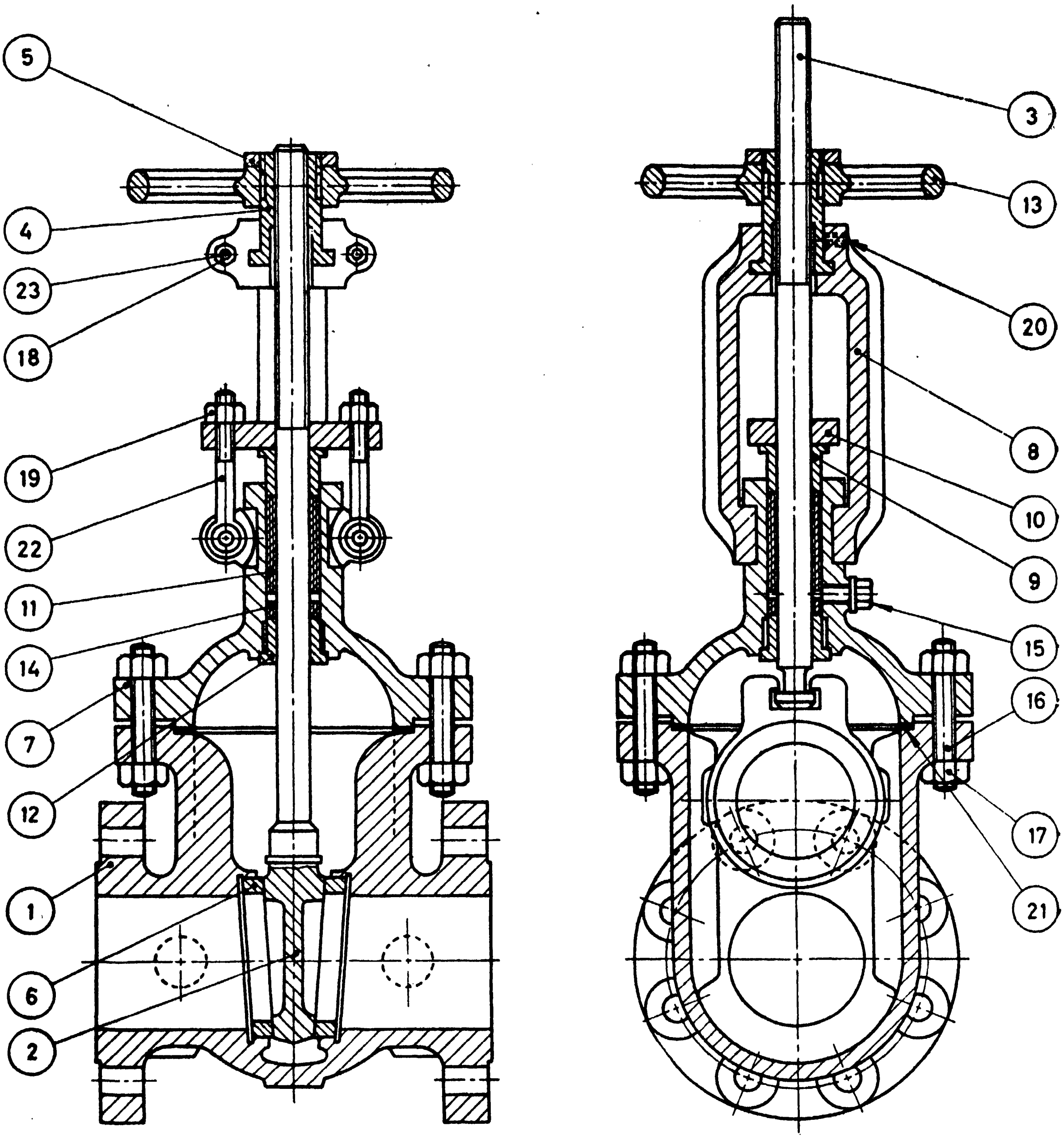


Part Reference	Description
1.	Valve Body Double Flanged
2.	Gate
3.	Stem
4.	Stem Nut/Yoke Bush
5.	Hand Wheel Nut
6.	Body Seat Ring
7.	Bonnet
8.	Yoke Split
9.	Gland
10.	Gland Flange
11.	Lantern Ring
12.	Back Seat Bush
13.	Hand Wheel
14.	Gland Packing
15.	Pipe Plug
16.	Studs for Body and Bonnet
17.	Hexagonal Nuts for Body and Bonnet
18.	Hex-Nuts for Yoke Studs
19.	Hex-Nuts for Eye Bolts
20.	Grease Nipple
21.	Gasket for Body and Bonnet
22.	Eye Bolt
23.	Stud for Yoke

FIG. 1 STEEL GATE VALVES

AMENDMENT NO. 1 APRIL 1994
TO
IS 10611 : 1983 SPECIFICATION FOR STEEL GATE VALVES (FLANGED AND BUTT-WELDED ENDS) FOR PETROLEUM, PETROCHEMICALS AND ALLIED INDUSTRIES

(*Page* 4, *clause* 2.3) — Substitute the following for the existing matter:

'2.3 *Body/Bonnet Flanges* — The body/bonnet flanges shall be of circular form. However, below nominal size 50 DN and also valves of class 150 may have square, rectangular or oval form also. Flanges shall be spot faced or back faced.'

(HMD 17)

Reprography Unit, BIS, New Delhi, India

TABLE 1 MINIMUM SHELL — WALL THICKNESS AND MINIMUM STEM DIAMETER IN mm

(*Clauses* 2.2, 2.6, 2.12.2 and 5)

Valve Size in mm	Nominal Pressure Ratings											
	CLASS-150		CLASS-300		CLASS-600		CLASS-900		CLASS-1 500		CLASS-2 500	
	Shell Wall Thickness	Stem OD	Shell Wall Thickness	Stem OD	Shell Wall Thickness	Stem OD	Shell Wall Thickness	Stem OD	Shell Wall Thickness	Stem OD	Shell Wall Thickness	Stem OD
25	6·4	15·9	6·4	15·9	7·9	15·9	Use Class 1 500 dimensions for these sizes		12·7	19·9	15·0	19·1
32	6·4	15·9	6·4	15·9	8·6	15·9	do		14·2	19·1	17·5	19·1
40	6·4	17·5	7·9	19·1	9·4	19·1	do		15·0	22·2	19·1	22·2
50	8·6	19·1	9·7	19·1	11·2	19·1	do		19·1	25·4	22·4	25·4
65	9·7	19·1	11·2	19·1	11·9	22·2	do		22·4	28·6	25·4	28·6
80	10·4	22·2	11·9	22·2	12·7	25·4	19·1	28·6	23·9	31·8	30·2	31·8
100	11·2	25·4	12·7	25·4	16·0	28·6	21·3	31·8	28·7	34·9	35·8	34·9
150	11·9	28·6	16·0	31·8	19·1	38·1	26·2	41·3	38·1	44·5	48·5	47·6
200	12·7	31·8	17·5	34·9	25·4	41·3	31·8	47·6	47·8	54·0	62·0	60·3
250	14·2	34·9	19·1	38·1	28·7	47·6	36·6	54·0	57·2	63·5	6 ·6	73·0
300	16·0	38·1	20·6	41·3	31·8	50·8	42·2	57·2	66·8	69·9	86·6	82·6
350	16·8	41·3	22·4	44·5	35·1	57·2	46·0	60·3	69·9	76·2		
400	17·5	44·5	23·9	47·6	38·1	60·3	52·3	63·5	79·5	76·2		
450	18·3	47·6	25·4	50·8	41·4	63·5	57·2	76·2	88·9	95·2		
500	19·1	50·8	26·9	54·0	44·5	69·9	63·5	82·6	98·6	108·0		
600	20·6	57·2	30·2	63·5	50·8	76·2	73·2	101·6	114·3	127·0		

Note 1 — Shell comprises the body and the bonnet.

Note 2 – Stem diameters listed are the minimum dimensions in the packing area.

Note 3 — Stem diameter 50·8 mm 4 smaller −0·13 mm maximum tolerance is longer than 50·8 mm −0·51 mm maximum tolerance.

2.2.5 For butt welded end valves, the ends shall be circular and integral with the body. The butt weld ends shall conform to 'Indian Standard specification for butt welded ends (*under preparation*)'.

2.2.6 The nominal inside diameter of the seat opening shall not be less than specified in 'Indian Standard specification for steel pipe flange and flanged fitting (*under preparation*) for the inside diameter of flanged fittings.

2.2.7 *Bypass, Drain and Tap*

2.2.7.1 Drain connections in the body shall be furnished if specified in the purchase order. If required, for a valve 50 mm or larger they shall be sized and located as per IS : 9625-1980, 'Locations of bypass and drain connection for valves'.

2.2.7.2 If a tap is made in the body for testing the valves, it shall not be larger than nominal size 1/2 in accordance with IS : 554-1975 'Dimensions for pipe threads where pressure tight joints are required on the threads (*second revision*).' After testing the tapped hole shall be fitted with threaded plug. The test tap boss, etc shall be in accordance with IS : 9625-1980.

2.2.7.3 If a tap is made in the bonnet for testing the valve, it shall confirm with requirements specified herein.

2.2.7.4 Bypass shall not be furnished unless specified in the purchase order.

2.2.7.5 Any by-pass furnished shall be of the valve external type. It shall be connected on the side of the valve in accordance with IS : 9625-1980.

2.2.7.6 By-pass valve shall be a globe type (OS & Y) rising stem with a flanged bonnet. Valve shall be at least of the same rating as the main valve.

2.2.8 Separate seat rings shall be furnished in the body except as follows:

a) Austenitic steel valves may have seats integral with the body.

b) If either an austenitic or hardfaced body seat material is furnished, the seat material may be deposited directly on the valve body or on separate seat rings.

Seat rings may be shoulder seated or bottom seated and may be either threaded, rolled in, or welded in. Threaded seat ring shall be provided with lugs or slots to facilitate removal. A light lubricant may be used to facilitate assembly of threaded or rolled seat rings, but the use of a sealing compound is prohibited. The seating surfaces of the seat rings shall be chamferred on the outside and inside diameters.

2.3 *Body/Bonnet Flanges* — The body/bonnet flanges shall be of circular form except that for all valves below nominal size 50 DN, they may be square or rectangular. Flanges shall be spot faced or back faced.

2.4 *Body/Bonnet Joints* — The body and bonnet joint shall be welded/bolted type as specified. In all cases the joint may be any of the following types:

a) Male and female type;

b) Tongue and groove type; and

c) Ring joint type.

Except for a class 150 which may be of plain/flat face type.

2.4.1 The body and bonnet joint shall have a minimum of four studs or stud bolts. For nominal size below 50 DN, studs/collar bolts may be used. The minimum size of the bolts shall be as given below:

Valve Size Nominal mm	*Bolt Size (Min) Nominal* mm
25 to 65	M10
80 to 200	M12
250 and above	M16

However, the design of the bolting shall be such that the total root cross-sectional area of the bolts shall be sufficient to produce a stress not exceeding 632 kgf/cm^2 (62 MPa) in the bolting material, by a pressure equal to the nominal pressure rating, acting on an area bounded by the effective outside periphery of the gasket (for a ring joint, use pitch circle diameter).

2.5 To permit repacking of valve in open position while in service, a machined conical or spherical back seat shall be provided in bonnet which contacts a corresponding seating surface in valve stem. Bonnet back seat shall be in a bushing at stem hole except that for a valve with either an austenitic or hardfaced trim., Seating surface may be on a welded deposit. On an austenitic steel valve back seat may be either an integral surface or welded on. Hardfacing shall have a minimum finished thickness of 1·6 mm.

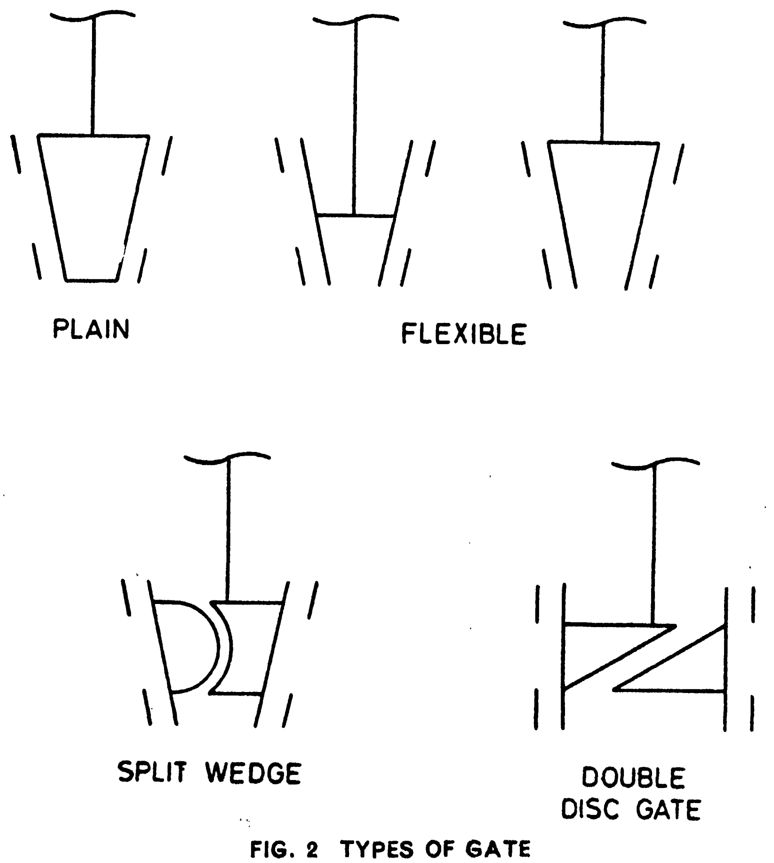
2.5.1 Stem hole in the back seat bushing shall be designed with proper clearance for guiding the stem and to prevent packing extrusion. Any weld deposit/hardfacing shall have a minimum finished thickness of 1·6 mm.

2.6 *Yoke* — The yoke shall be integral with or separate from the bonnet. Bonnet with integral yoke shall be so designed as to permit the removal of the stem nut/yoke bush without removing the bonnet from the valve.

2.6.1 The yoke to stem nut bearing faces and yoke to bonnet joint faces (in case of separate yoke) shall be machined.

3. Gate — Types of gates shall be classified as follows:

a) Wedge gate:
  i) Solid wedge gate (plain and flexible),
  ii) Split wedge gate, and
b) Double disc gate, (*see* Fig. 2).



PLAIN

FLEXIBLE

SPLIT WEDGE

DOUBLE
DISC GATE

FIG. 2 TYPES OF GATE

3.1 The gate shall be a wedge gate or double disc as specified in purchase order. Except for a double disc the fully open gate shall completely clear the valve seat opening.

3.2 If a wedge gate is specified a solid wedge gate shall be furnished unless otherwise specified.

3.3 A solid wedge gate is a one piece gate which may be fabricated by welding It may be either a plain solid wedge having essentially a trapezoidal (or an 'I') cross section, or a flexible solid wedge having a tapered 'H' or inverted 'U' cross section.

3.4 A split wedge gate is a two piece gate with the two parts positioned in a manner optional with the manufacturer. The valve design shall be such that the parts cannot become separated regardless of the gate position.

3.5 A double disc gate valve shall have parallel seats, and the gate shall have an internal spreading device (for example wedging device) which operates when the gate is closed to a position opposite the seat opening, spreading the two discs firmly against the body seats.

3.6 The gate and valve body shall have guide surfaces to minimise wear of the seats during valve operation and to ensure wedge/stem alignment in all positions-possible loss of metal because of corrosion, erosion and/or abrasion wear shall be considered in the design of both gates and shell guide surfaces.

3.7 The gate seats shall be integral or shall consist of deposited welding metal or of welded-on gate rings completely welded on the inside and outside circumferences. The seats are not required to be hard faced unless a hard face trim is specified in the purchase order. Any hard facing shall be with a minimum finished thickness of 1·6 mm.

3.8 For wedge gate valve, the seating design shall provide adequate seating width, both before and after the wear of seating surface.

The width of the body and gate seats shall be so proportioned by seating the new gate high on the body seats, the gate seats will still completely contact the full effective seating width of the body seats after the gate's closed position has travelled down (due to seat wear) by a distance (wear travel) not less than the following:

Valve Size mm	*Wear Travel, Min* mm
25 to 50	2·3
65 to 150	3·3
200 to 300	6·4
350 to 450	9·7
500 to 600	12·7

Wear travel of the wedge gate is illustrated in Fig. 3.

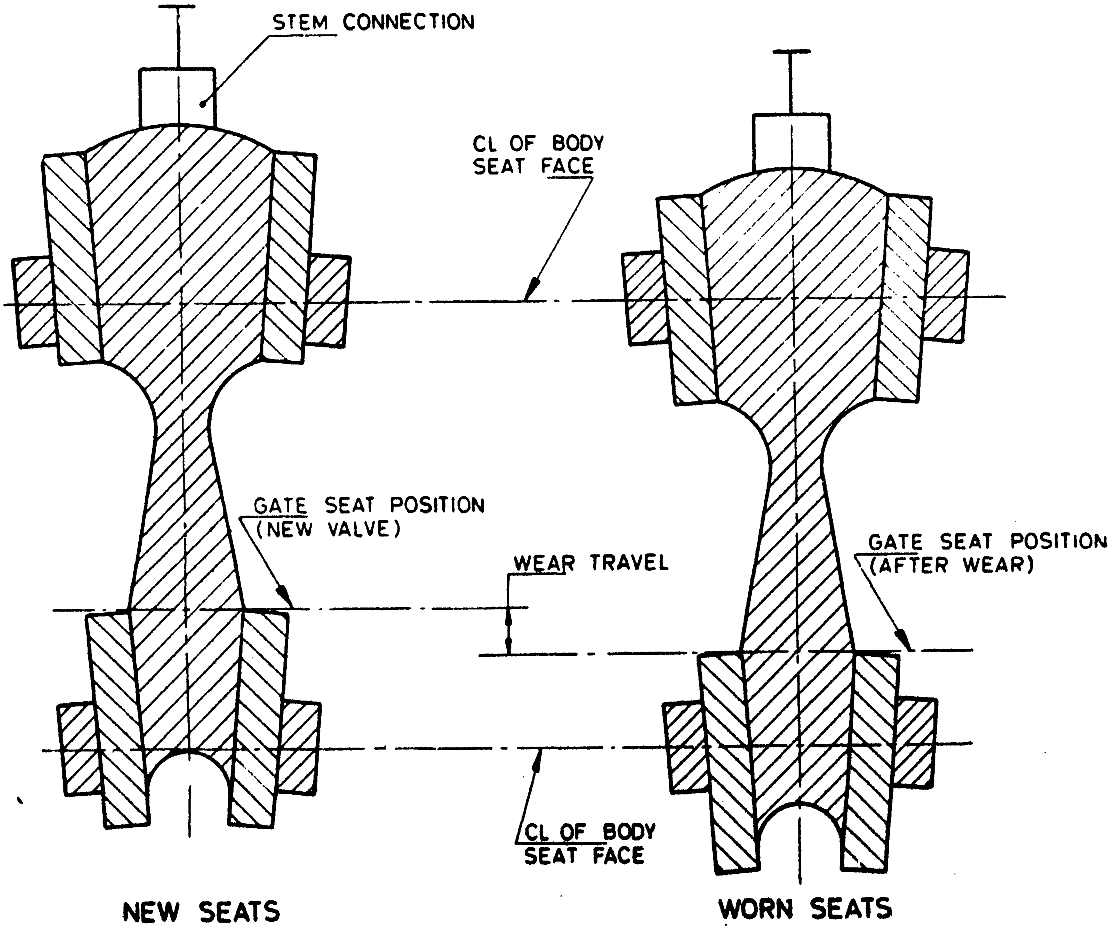


FIG. 3 WEAR TRAVEL OF WEDGE GATES

4. Handwheel and Handwheel Nut — The handwheel for a direct handwheel operated valve shall be spoke and rim design not having more than six spokes. Where the space between the spokes is limited the provision of knobs or studs projecting beyond the outside diameter of the handwheel is allowed.

4.1 Unless the wheel size makes it impracticable, the handwheel shall have on it the word 'open' and an arrow pointing in the direction to open a valve.

4.2 The handwheel shall be fixed to the stem nut by a threaded handwheel nut.

4.3 The valve shall be opened by turning the handwheel in anticlock wise direction

5. Stem and Stem Nut — The size of stem (minimum outside diameter) shall be as specified in Table 1. To allow the use of standard diameter round bar an undertolerance is permitted.

5.1 The stem connection to a wedge gate shall have a 'T' head which is integral with the stem. Stem connection to a double disc gate may be threaded. This connection shall prevent turning of the stem or disengagement of the stem from the gate while the valve is in the service. The strength of this connection (in tension) shall at least equal the strength of the stem at the root of its operating thread.

5.2 The stem shall have an integral conical or spherical backseat surface to seat against the bonnet back seat with the gate fully open.

5.3 The stem shall be operated by a rotating stem nut mounted at the top of the yoke. Stem nut shall have a hexagon shank, a round shank with a key way or other drive of equivalent strength and durability for attachment of the handwheel. Stem nut arrangement shall be designed to permit removal of the handwheel without allowing the stem and gate to drop into the shut position if the handwheel is removed with the valve open.

When threaded bushing is used to retain the stem nut, it shall be retained by a weld or other suitable means to ensure no movement during valve operation. Metal peening is not permitted.

5.4 The stem shall have threads of Acme stubacme or trapezoidal form in accordance with IS : 7008-1973 'ISO metric trapezoidal screw threads'. On direct handwheel operated valves these threads shall be left-handed.

5.5 The stem shall be ground finished to prevent damage to packing during operation. The surface roughness of the ground portion shall be between 0·4 to 1·6 μm (16 and 63 microinches as per AARH standard).

5.6 The stem threads shall project outside the stem nut on a new closed valve by an amount at least equal to the required wear travel. The max stem thread projection shall be 5 times the wear travel for valves 150 mm and smaller, 3 times the wear travel for valves more than 150 mm.

5.7 All contact surfaces between the stem nut and the yoke shall be machined flat and parallel. Ball or roller bearings with a grease fitting shall be furnished as follows:

Nominal Pressure Rating	*Valve size (Nominal)*
Class 600 and upwards	150 mm and larger

Adequate provision for lubrication shall be made in all classes and sizes.

6. Stuffing Box, Packing and Lantern — Stuffing box bore shall be as specified in Table 2 and shall have a minimum depth (for square packing of width shown in Table 2) as follows:

6.1 For Cl-150 valve, equivalent to 6 rings of packing.

6.2 For Cl-300 to Cl-2 500 valves, equivalent to a lantern length plus 5 rings of packing above, 2 rings of packing below the lantern.

6.3 Packing gland shall be flanged with holes (not slots) for two gland bolts. The gland shall be a one-piece design (solid, with or without bushing) or a two-piece self-aligning design consisting of a gland proper and a separate gland flange. The gland proper of a two piece gland shall have a shoulder on its outer end to prevent complete entry of the gland into the stuffing box.

6.4 The recommended packing width is specified in Table 2. The stuffing box shall be completely filled with packing prior to compression by the gland. Packing may be square or rectangular.

TABLE 2 STEM DIAMETER STUFFING BOX BORE AND PACKING WIDTH

(*Clause* 6)

Nominal Stem OD	Packing Width (Nominal)	Stuffing Box Bore (Nominal)
15·9	6·4	29·4
17·5	6·4	31·0
19·1	6·4	32·5
22·2	6·4	35·7
25·4	6·4	38·7
28·6	7·9	45·2
31·8	7·9	48·4
34·9	7·9	51·6
38·1	9·5	57·9
41·3	9·5	61·1
44·5	9·5	64·3
47·6	9·5	67·5
50·8	11·1	73·8
54·0	11·1	77·0
57·2	12·7	83·3
60·3	12·7	86·5
63·5	12·7	89·7
69·9	12·7	96·0
73·0	14·3	102·4
76·2	14·3	105·6
82·6	19·0	121·4
88·9	19·0	127·8
95·2	19·0	134·1
101·6	19·0	140·5
108·0	19·0	146·8
127·0	25·4	178·6

6.5 A lantern shall not be furnished in a Cl-150 valve. In a valve of Cl-300 to Cl-2 500 nominal rating a lantern shall be furnished only if specified in the purchase order. A lantern shall have two holes spaced 180° on each end, for its removal. These hole shall be either through hole for use of hook or tapped. If lantern is furnished the stuffing box shall be tapped opposite the centre of the installed lantern and fitted with a threaded round plug not less than R 1/4 IS : 554-1975 'Dimensions for pipe threads where pressure tight joints are required on the threads' (*second revision*) with boss as specified herein for a test tap in the bonnet if required for thread engagement.

6.6 The inside of the stuffing bore shall be reamed or machined smooth to prevent any damage to packing during compression.

6.7 The packings shall be square or rectangular in cross-section. Moulded packing in lieu of braided packings may also be used.

7. Bolting — Bonnet flange bolts shall be continuously threaded stud bolts, with heavy, semi-finished hexagon nuts conforming to IS : 1364-1967 'Precision and semi-precision hexagon bolts, screws, nuts and lock nut (diameter range 6 to 39 mm) ' for bolting up to M 39, IS : 3138-1977 ' Hexagonal bolts and nuts (M42 to M150), for bolding between M42 and M150.

7.1 Yoke bolting shall be continuously threaded stud bolts or headed bolts with hexagon nuts.

7.2 Gland bolts shall be headed bolts, hinged eye bolts, stud bolts, or studs with hexagon nuts. Slotted brackets on the bonnet neck shall not be used.

7.3 Bolting 25 mm or smaller shall have coarse metric threads. Sizes larger than 25 mm shall be of the metric threads class 2B, conforming to IS: 1364 but any studs used for gland bolting shall be fitted into the stuffing box flange with class 5 interference fit.

8. Operation — Unless otherwise specified in the purchase order the valve shall be direct hand-wheel operated.

8.1 If chainwheel operation is required, the type of the chainwheel shall be as specified in the purchase order and any required chain also shall be as specified.

8.2 If gear operation is required, the type of gears and their arrangements shall be as specified in the purchase order.

8.3 If power operation is required, the type of power and power unit and the design maximum pressure differential across the valve shall be as specified in the purchase order.

9. Material

9.1 *Body/Bonnet* — Body and bonnet shall be of the material specified in the purchase order.

The material of the body and bonnet depending on the service conditions, shall, as far as possible be selected from the list of materials specified in Table 5.

9.2 *Body Seat Rings* — A body seat ring made of a material other than its seating surface shall be of a material at least equal to that of the shell.

9.3 *Bonnet Gasket* — Bonnet flange gasket shall be metallic spiral wound (filled in with asbestos filler) or flat steel or soft iron or single or double jacketed steel and asbestos suitable for the pressure rating of the valve within a valve design temperature range of −29°C to 540°C. The metallic material of the gasket shall have corrosion resistance at least equal to that of the shell.

An asbestos filled spiral wound metal gasket is acceptable provided the gasket design incorporates a sentering/compression ring or the body to bonnet joint design provides inherent compression control to ensure proper seating of the gasket.

9.3.1 For class 150 valves compressed asbestos fibre jointing may be used.

Note — Free chlorides in asbestos fibre material when used with low alloy or austenitic stainless steel may cause stress corrosion cracking. Hence, suitability of alternate gasket material should be, looked into while ordering.

9.3.2 *Bolting* — The body bonnet joint bolting shall conform to IS : 1570 Gr40 Cr4 Mo3 studs with IS : 1570 Gr 5C8 or 55C8 nuts or equivalent. If any other bolting material is required, the same shall be specified in the purchase order.

9.4 *Gate* — A gate fitted with separate facings or on which seating surfaces are welded shall at least equal to the corrosion resistance of the material of the shell.

9.5 *Yoke* — Yoke separate from the bonnet shall be of carbon steel or of the same material as the shell.

9.6 *Handwheel, Chainwheel, and Nut*

9.6.1 Handwheel or chainwheel shall be of steel, malleable iron or nodular iron. Handwheel or chainwheel may be fabricated from other carbon steel product forms provided the strength and toughness are comparable to those made by casting or forging. Pressed or stamped handwheels shall not be used.

9.6.2 Hand-wheel or chain-wheel nut shall be of austenitic steel, malleable iron, or nodular iron or carbon steel. Any other material shall be subject to agreement between the purchaser and the manufacturer.

9.7 *Stem Nut* — Stem nut shall be of a non-ferrous copper alloy or ductile nodular 'Ni' resist having a suitable bearing quality and a minimum melting point above 955°C.

9.8 *Gland* — A one-piece gland or any gland flanges shall be of steel. A bushing of a one-piece gland or the gland proper of a two piece gland shall be made of a material having a minimum melting point above 955°C.

9.9 *Trim* — Trim comprises the following:

a) Stem
b) Body seat surface
c) Gate seat surface
d) Bushing for back seat and stem hole guide
e) Any small internal parts that normally contact the service fluid, excluding the pin used in making a stem to gate connection. (This pin shall be of an austenitic steel material).

9.9.1 Trim material except as stated in the following items 1 through 4 shall be the manufacturer's standard material of the type shown in Table 3, for the nominal trim specified in the purchase order. Typical specifications in Table 3 represent some acceptable grades.

a) If trim No. 1 or No. 6 is specified trim No. 9 may be furnished as an alternate.
b) If trim No. 1 to No. 5 is furnished body seat ring surface, and gate seat surface shall be of the material type shown in the table.

c) If a combination trim (No. 6, 7 or 9) is furnished the body seat ring surface shall be of either of the two material types shown in the table, and the gate seat surface shall be of the other material types shown (*see* Table 3).

d) The stem, the bushing for the back-seat and stem whole guide, and the aforementioned small internal parts shall be of the material type and hardness shown in Table 4. The stem shall be of wrought material.

9.10 *Lantern* — Lantern, if furnished, shall be of material at least equal to that of the shell.

TABLE 3 NOMINAL SEATING SURFACE MATERIALS

(*Clause* 9.9.1)

Trim Number	Nominal Trim	Seat Hardness (HB* *Min*)	Material Type	Typical IS Specification (Grade)	
				Cast	Forged
1	F6	†	13 Cr	1 570 Gr 12	3 444 Gr 10
2	304	‡	18-8 Cr-Ni	7 806 Gr 3	1 570 Gr 4
3	F310	‡	25-20 Cr-Ni		
4	Hard F6	750§	Hard 13 Cr		
5	Hardfaced	350§	Co-Cr-A††		
5A	Hardfaced	350§	Ni-Cr		
6	F6 and Cu-Ni	250¶ 175¶	13 Cr Cu-Ni	1 570 Gr 12	3 444 Gr 10
7	F6 and Hard F6	300¶ 750¶	13 Cr Hard 13 Cr	1 570 Gr 12	3 444 Gr 10
8	F6 and Hardfaced	300¶ 350¶	13 Cr Co-Cr-A‡‡	1 570 Gr 12	3 444 Gr 10
8A	F6 and Hardfaced	300¶ 350¶	13 Cr Ni-Cr	1 570 Gr 12	3 444 Gr 10
9	Monel	‖	Ni-Cu alloy		Manufacturer's standard
10	316	‡	18-8 Cr-Ni	7 806 Gr 5	1 570 Gr 5
11	Monel and Hardfaced	‡ 350¶	Ni-Cu alloy Trim 5 or 5A		Manufacturer's standard
12	316 and Hardfaced	‡ 350¶	18-8 Cr-Ni Trim 5 or 5A	7 806 Gr 5	1 570 Gr 5
13	Alloy 20	‡	19-29 Cr-Ni		
14	Alloy 20 and Hardfaced	‡ 350¶	19-29 Cr-Ni Trim 5 or 5A		

*HB is Brinell hardness number symbol.

†Body and gate seats 250 HB minimum, with 50 HB minimum differential between body and gate seats.

‡Manufacturer's standard hardness.

§Differential hardness between body and gate seat surfaces not required.

‖Case hardened by nitriding to thickness of 0·005 inch (0·13 millimetres) minimum.

¶Hardness differential between body and gate seats shall be the manufacturer's standard.

**Manufacturer's standard, with 30 Ni minimum.

††This classification includes such trade-marked materials as Stellite 6, Stoody 6, etc.

‡‡Manufacturer's standard hardfacing, with 25 percent Fe maximum.

9.11 *Stem Packing* — Packing shall be of braided asbestos containing a sacrificial metal corrosion inhibitor, suitable for a steam or petroleum fluid at a packing design temperature of 400°C, unless the purchase order specifies other packing or a higher packing design temperatures.

9.12 *Bolting* — Bonnet bolts shall be as per Indian Standard specification for steel pipe flanges and flanged fittings (*under preparation*) and nuts in accordance with IS : 1364 Class 2B unless other bolt material is specified in the purchase order, for a bolt metal temperature below −29°C or above 482° C.

9.12.1 Material for the gland and yoke bolting shall be in accordance with IS : 7283-1974 'Hot ·olled bars for production of bright bars'.

9.13 *Plug* — Material for pipe plugs for a test tap or for a tapped connection at a lantern shall at least be equal to the corrosion resistance of the material of the shell.

9.14 *By-pass* — Any by-pass valve and its piping shall be of material at least equal to the corrosion resistance of the material of the shell.

9.15 *Name Plate* — For a valve 150 mm or larger name plate material shall be 18/8 Cr Ni steel or nickel alloy, attached to the valve by pins of similar material or by welding

9.15.1 For a valve 100 mm or smaller, name plate material and attachment shall be manufacturer's standard material using a metal, resistant to atmospheric corrosion. Brass or aluminium is acceptable.

10. Valve Components — Valve components shall be designed and manufacturing tolerances set, to allow interchangeability of parts between units of same size, class and type from any one manufacturer.

11. Inspection and Test

11.1 *Inspection* — If inspection by purchaser is specified in the purchase order, inspection shall be as specified in IS : 6157-1981 'Valves inspection and test (*first revision*)'. If this inspection is not specified the valve shall meet requirements for visual examination, described in IS : 6175-1981.

11.2 *Pressure Tests* — Each valve shall be pressure tested in accordance with IS : 6175-1981.

12. Marking — Marking shall be in accordance with IS : 9866-1981 'Marking system for valve'.

12.1 *ISI Certification Marking* — Details are available with the Indian Standards Institution.

13. Coating — Unmachined exterior surfaces of the shell shall be painted with heat resistant aluminium paint except for austenitic steel valves which shall not be painted. Valves which have already been given a coat of parkarising or phosphatising need not be given aluminium coating.

13.1 Machined or threaded surfaces shall be coated with an easily removable rust preventive. The stem is not required to be coated if the stem packing contains a sacrificial metal corrosion inhibitor.

14. Shipment — The valves shall be dried and cleaned thoroughly after testing.

14.1 The valves shall be shipped in closed position, glands fully packed and all openings properly closed. End flanges and/or welding ends shall be blanked over their entire surface with bolted or steel strapped wood, fibre plastic or metal or other suitable covers (not smaller than the raised face diameter of the flange) properly secured against opening. The end protector can also be securely attached to the valve end by suitable triction lending device. Covers shall be of such design that the valve cannot be installed without removal of protector cover. Any tapping shall be protected with thread protectors.

14.2 All machined and threaded parts shall be suitably protected with an approved rust preventive.

14.3 Valves shall be stipped with handwheel removed to protect against damage during transit. The handwheels shall be packed in a separate box, if the number of valves is 10 or more. For less than 10 valves, the handwheels may be attached to the valves by wires or other suitable means.

14.4 The valves shall be shipped in wooden crates individually or collectively in a manner to prevent shifting within the package.

TABLE 4 MATERIAL OF STEM, BUSHING OR WELD-DEPOSIT, AND SMALL INTERNAL PART

(*Clause* 9.9.1)

Trim Number	Material Type	Hardness (HB, *Min*)		
		Stem	Bushing	Small Internal Parts
1	13 Cr	200	250	Manufacturer's standard
2	18-8 Cr-Ni	Manufacturer's standard	Manufacturer's standard	Manufacturer's standard
3	25-20 Cr-Ni	Manufacturer's standard	Manufacturer's standard	Manufacturer's standard
4 through 8	13 Cr	200	250	Manufacturer's standard
9 and 11	Ni-Cu Alloy	Manufacturer's standard	Manufacturer's standard	Manufacturer's standard
10 and 12	18-8 Cr-Ni	Manufacturer's standard	Manufacturer's standard	Manufacturer's standard
13 and 14	19-29 Cr-Ni	Manufacturer's standard	Manufacturer's standard	Manufacturer's standard

TABLE 5 BODY AND BONNET MATERIAL

(*Clause* 9.1)

	Material Type	Steel Designation	Reference to IS :
	Carbon Steel	Gr 2	2836 - 1979
C	Carbon Steel (low temperature)	25 C 8	1570 - 1979
A	½ Mo Steel (low temperature)	Gr 4	4899 - 1976
S	1 Cr ½ Mo Steel	Gr 4	3038 - 1974
T	2¼ Cr 1 Mo Steel	Gr 5	3038 - 1974
I	5 Cr ½ Mo Steel	Gr 6	3038 - 1974
N	18 Cr - 8 Ni	Gr 6	3444 - 1978
G	18 Cr - 10 Ni - 2 Mo	Gr 9	3444 - 1978
S	18 Cr - 8 Ni - No - Nb	Gr 7	3444 - 1978
	Carpenter Alloy	Gr 15	3444 - 1978
	3½ percent Ni Steel	Gr 3	4899 - 1976
	Carbon Steel	Gr 3	2004 - 1978
F	Carbon Steel (low temperature)	15 C 8	1570 - 1979
O	1 Cr ½ Mo Steel	15 Cr 70 Mo $\underline{55}$	2611 - 1964
R	2¼ Cr 1 Mo Steel	10 Cr 2 Mo 1	1570 - 1979
G	5 Cr ½ Mo Steel	20 Cr 5 Mo 55	1570 - 1979
I	3½% Ni Steel	15 Ni 14 Cr 3 Mo 2	1570 - 1979
N	18 Cr - 8 Ni	04 Cr 19 Ni 9	1570 - 1979
G	18 Cr - 8 Ni - Mo	05 Cr 18 Ni 11 Mo 3	1570 - 1979
S	18 Cr - 8 Ni - Nb	04 Cr 19 Ni 9 Nb $\underline{40}$	1570 - 1979
	18 Cr - 8 Ni - Ti	04 Cr 19 Ni 9 Ti $\underline{35}$	1570 - 1979

Note — Material used shall be subjected to heat treatment procedure required by the corresponding material specification.

14.5 Shipping of loose valves is not recommended and if done, it will be at the risk of the manufacturer, who will replace the same if any valves are damaged during transit.

15. **Guarantee** — The manufacturer shall by acceptance of the purchaser's order, guarantee the material, the design and the operation of the valves covered by the order to the extent, that if any defect attributable to faulty workmanship, design or material are found in the valves withih a period of one year after they are placed in regular service or 18 months from the date of receipt of the valves (whichever is less), the manufacturer will furnish free of charge at the original point of delivery any part or parts thereof that prove defective, provided the valves have not been misused or abused and have been installed in service for which they are recommended. If any valve is found to be defective prior to placement in service, the same shall be replaced by the manufacturer free of cost.

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